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TITLE: Virtual addressing of optical storage media as magnetic tape equivalents

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Brief Summary Text (285):
The assignee of the present invention, (Data/Ware Development Inc. San Diego Calif.), first offered an I/O Channel Tester as an IBM channel attached product. The I/O Channel Tester was needed to simulate peripherals in order to debug and test IBM I/O channels. The I/O Channel Tester is unique in that it forces errors on command. The I/O Channel Tester is a generic control unit emulator. The I/O Channel Tester was designed for the plug compatible mainframe manufacturers. The unit is able to emulate the operation of byte/block/selector type controllers from ten kilo bytes per second to three mega bytes per second.

Detailed Description Text (25):
Each virtual tape has a Volume & Serial Number (VSN), a length, and a pointer to its tape map, which defines the structure and contains access control information for each data record. Each virtual tape has a volume and serial number according to IBM convention. Mount messages sent by the host computer to MOST are automatically interpreted and acted upon. If the requested virtual tape resides on a disk currently loaded in the optical disk drive, the virtual tape will be mounted

through the action of the MOST controller. If the requested virtual tape resides on a disk which is not currently loaded in the optical disk drive, the disk will be retrieved through the robotics of the media handler.

Detailed Description Text (34):
The optical disk system is able to interpret and act on mount and demount messages directly, providing fully automated operation. In a jukebox configuration, thousands of virtual tapes can be handled automatically with no operator intervention. MOST uses conventional monitors with key boards as operator consoles to emulate the control panels of the virtual magnetic tape drives. The video screens display the control panels providing the operators with the touch and feel of a 3480 magnetic tape subsystem.

Detailed Description Text (49):
MOST 10 contains a controller 14 for interpreting channel commands, controlling the data flow, and managing buffer operations. The MOST controller 14 communicates with the jukebox 18 via a single, asynchronous, full duplex, EIA serial communication standard, RS232 port 19 at ninety-six-hundred baud. The jukebox commands include motion commands, e.g. get or put cartridge, and special commands, e.g. test and query status. The MOST controller 14 connects the IBM channel 34 to the optical disk drive SCSI port 17, and to the RS 232 interface 19, while providing a plug compatible device emulation, thereby making eight-hundred giga bytes of online data available to IBM mainframes.

Detailed Description Text (73):
The virtual tapes are permanently written by a laser beam on the optical disks and are, therefore, tamper proof. Any virtual tape can be retrieved through the I/O Channel by the mainframe from a selected optical disk 20, and, after processing, the revised data can be written out through the I/O Channel 34 to unused sectors of the optical disk for permanent storage. The retrieval of virtual tapes is inherently much faster than retrieval of magnetic tapes, since robotic access to, and random access within, the collection of virtual tapes on the optical disk eliminates the time consuming delays associated with magnetic tape retrieval and serial access functions.

Detailed Description Text (90):
The jukebox 18 is controlled by an intelligent RS-232 controller serial I/O board 44. This serial I/O board 44 is capable of issuing the command strings necessary to drive the jukebox 18. The response strings that the jukebox 18 returns are saved in SBC VME Bus memory of the SBC 40 and the SBC 40 is interrupted to interpret them. In this way the SBC 40 is freed from the burden of polling necessary when utilizing on-board RS-232 ports. The Cygnet Jukeboxis preferred because it is RS232 controlled, is drive media independent, has high capacity for both drives and media, is high speed, is reliable, and is maintainable.

Detailed Description Text (95):
The SBC 40 is the system controller for the VMEBus 46 handles the interrupts. These interrupts are central to all VMEBus based I/O operations. The SBC 40 interprets interrupts from each I/O processor including the VMEGate 36, the SCSI controller 42, the RS-232 serial I/O processor 44, etc. and coordinates them to route data between the I/O channel 34 and the optical disk drives 16.

Detailed Description Text (102):
The VMEGate 36 receives its commands through an SBC/VMEGate slave interface and accepts them through a handshake in SBC memory accessible though the VMEBus 46. Upon completion of commands, the VMEGate 36 will interrupt the SBC 40 at either interrupt levels four or six. The VMEGate interrupts are also used to alert the SBC 40 to channel activity and commands. The VMEGate 36 interrupts are placed at the highest level of priority so that the channel 34 is never kept waiting for other SBC processing to complete. The VMEGate uses a RAM look-up table to recognize its

address and to quickly vector to code that interprets Channel Command Words (CCWs).

Detailed Description Text (133):
Optical media 20 can be in the drive 16, in which case the virtual tape is online, or in the jukebox 18, in which case the virtual tape is within ten seconds of being online, or on the shelf, in which case an operator will be required to import the media perhaps requiring a few minutes. The jukebox 18 is designed to perform two robotically controlled operations concurrently. That is, one drive can be unloaded at the same time the other drive is being loaded. The controller 14 is capable of controlling up to four jukeboxes 18 concurrently. The jukebox 18 provides the functionality of the operator of the IBM 3480 subsystem. The jukebox 18 manages the media and performs the media mounts and dismounts. Mount messages sent by the attached host computer 12 to MOST 10 are automatically interpreted and acted. If the requested virtual tape resides on the a disk in the drive, then it will be "mounted" through the action of the controller 14. If the requested volume resides on a disk which is not currently in the drive, then the disk will be retrieved by the jukebox 18, and then mounted. When a requested volume is not contained in the jukebox 18 an operator will be required to make the mount. This process is assisted by MOST 10 which will indicate to the operator the identification number of the required optical media. The operator must then retrieve the media and import it into the jukebox. The jukebox is not opened, rather the media is inserted through the "mailbox" opening of the jukebox. The incoming disk 20 is logged into the jukebox 18 and made available i.e. mounted. The import process requires less than twenty seconds.

Detailed Description Text (139):
The system mode is the more complex than the manual mode. In the system mode, MOST 10 responds automatically to mount and dismount requests from the host computer 12. If a jukebox 18 is part of MOST 10, this response may include robotically retrieving the optical disk 20 on which the requested virtual tape resides. MOST 10 interprets mount and demount messages from the host 12 and locates and manages VSNs autonomously. No operator set up or intervention is required. When MOST 10 receives a mount message, it automatically locates the requested VSN and mounts it in the drive 16. With a jukebox 18, this may involve consulting the disk directory on the magnetic hard disk 50 to determine the disk location and side on which the virtual tape VSN is recorded. In the system mode, MOST 10 also employs dynamic drive allocation to eliminate the need for physically exchanging disks when a virtual tape mount request specifies a virtual tape that is contained on a disk 20 residing in a drive 16 that is allocated to a different channel address.

Detailed Description Text (150):
Tape emulation means that commands sent via the I/O Channel 34 are interpreted and handled as if MOST 10 were a 3480 tape system. The emulation of the 3480 is accomplished by the controller 14 responding to channel commands as would a 3480 magnetic tape subsystem. Host software which is compatible with the 3480 is compatible with MOST including the virtual operating systems, Job Entry Systems, D-Base-two database programs, and hierarchical storage managers. Programs written for the 3480 using full function support which manipulate the B22 displays for operator mounts will instead manipulate the jukebox 18. Hardware diagnostics for the 3480 will not in general run on MOST because there are specific implemental distinctions.

Detailed Description Text (215):
In the system mode, MOST 10 automatically interprets mount messages, and then references the hard disk containing the disk directory which informs the SBC which slot in the library contains the disk that holds the requested virtual tape. The SBC 40 then issues commands to the jukebox 18 which cause the correct disk to be loaded and the virtual tape to be mounted automatically without manual intervention. Once the desired optical disk is loaded and the virtual tape is

mounted, the mainframe 12 is notified that the drive is ready. After the virtual tape is mounted, the mainframe can read and write to the virtual tape just as it would to a normal 3480 tape in a drive.

Detailed Description Text (235):
The drive operating mode on the last line of the drive operator panel is selected by entering S or M on the keyboard to select, respectively, SYS meaning the drive operates in system mode, interpreting and acting on mount/demount messages from the controlling computer automatically, or, MANUAL meaning the drive operates in manual mode with the operator performs all virtual tape mounts and dismounts. The selected mode is displayed in reverse video.

Detailed Description Text (274):
The VMEGate 36 is an off the shelf IBM channel attachment product for both control unit emulators and channel emulators at three or four-point-five mega bytes per second Data Streaming and interlocking capabilities. The VMEGate 36 is supplied by DataWare Development Inc. of San Diego Calif., with microcode which accomplishes specific device emulation. VMEGate 36 is compatible with the FIPS 60-2 I/O Channel and the VME standard. The VMEGate 36 supports I/O protocols that can be programmed to conform to a Selector, Byte Multiplexer, or Block Multiplexer type IBM FIPS 60-2 I/O Channel Interface with data transfer rates being programmable from five-hundred-sixty kilo bytes per second to three or four-point-five mega bytes per second.

Detailed Description Text (340):
The SIHM is activated whenever a SCSI I/O board 42 issues an interrupt to the SBC 40. The SIHM interprets the status presented by the SCSI I/O board 42 and takes action based on it. SCSI status is stored in the SBB for the appropriate drive 16. Status indicating COMMAND COMPLETE, is also stored in the SBB.

Detailed Description Text (403):
The Next-LBA variable keeps track of the first unwritten LBA on the disk. This number is stored in the tape directory as a continuation pointer 326 and is moved into the Channel Address Buffer by the keypress module when a disk is Logically Loaded. The Next-LBA is checked to determine whether there is any more room on the disk are made. The Next-LBA is maintained by the SIHM which adds the length of SCSI writes to the Next-LBA. Skips are not added to the Next-LBA during SCSI writes of virtual tape data. At certain points, the Next-LBA is adjusted to equal the value of the next physical block address. When the tape map 340 is written to disk, the location it is written to is the next physical block address and the Next-LBA is updated accordingly. When the Next-LBA is inserted in the tape directory prior to being written back to the disk 20 by the keypress module the value is adjusted to the next unwritten physical block address.

Detailed Description Text (443):
Once the VMEGate 36 interprets a command, it clears the busy flag in the VMEGate Command Status Word. It may also set either the Reissue Command bit or the Command Failed bit in the VMEGate Command Status Word. The Command Failed bit is set if the VMEGate 36 was not in the required state when a VMEGate command was issued. The Reissue Command bit is set if there is a detection of an Initial Selection sequence from the channel to another device at the same time. The channel command has higher priority in this case and the VMEGate 36 informs the SBC 40 that it must reissue the command when the VMEGate 36 is not busy with the channel. The Commands required to direct the VMEGate 36 in responding to Channel Interface Sequences and Channel commands are INITIALIZE, DIAGNOSTIC, DOWN LOAD CVM, UP LOAD CVM, PRESENT STATUS, ONLINE, OFFLINE, GO NOT READY, INTERRUPT PROCESSED, GO READY, BUFFER READY, SELECTIVE RESET READY, SYSTEM RESET READY, and DEFERRED UNIT CHECK.

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